Catocala obscurata, Oberth. = *C. unicuba*, Walk.

I see that M. Oberthür has united the genera *Chrysorithrum* and *Bolina*! After this nothing will surprise me; for I do not think two genera of Noctuites less alike could easily be found.

Capnodes Jankowskii, Oberth.

Madopa flavomacula, Oberth.

Thus finishes M. Oberthür's first part of his Memoir on Lepidoptera of the Island of Askold. It is sincerely to be hoped that his next will be an improvement upon it, as it is impossible to overestimate the injury, through waste of time, which is occasioned to workers by the publication of duplicate names for the same species—a fault which, of all men, I had believed my friend M. Oberthür one of the most anxious to avoid.

XXI.—*Contribution to the Knowledge of the Family* Tintinnodea.

By Hermann Fol, Professor in the University of Geneva*.

[Plate XVII. figs. 1–6.]

Throughout the still imperfectly known class of the Infusoria there is perhaps no group of which the structure, classification, and synonymy are so obscure as those of the family of the *Tintinni*. This is because most authors have thrown pell-mell into this family very diverse forms, characterized so insufficiently that one does not know what to make of such problematical types. Or, again, we have seen authors who only knew a small number of forms belonging to a different group, take these forms as the type of the family, and, upon this erroneous basis, upset the diagnosis of the latter.

But, before seeking to establish the zoological position of our Infusoria, it will be well to cast a glance at the organization of the forms that I have observed, so as to be able to compare my results with those of other authors.

The Tintinnodea are very abundant in the roads of Villefranche, but all belong to a few species which I shall describe hereafter. These species, moreover, will be divided into three distinct genera, taking as the basis of the classification the form of the test. Nevertheless the structure of the animals presents a remarkable uniformity.

* Translated by W. S. Dallas, F.L.S., from the 'Bibliothèque Universelle : Archives des Sciences Physiques et Naturelles,' 3e période, tome v. pp. 5–24, January 15, 1881. The writings of previous authors are referred to by numbers, which are explained in a bibliographical list at the end of the memoir.

The body (Pl. XVII. figs. 2 and 4) is, in general terms, conical, terminated above by a broad disk, and produced below into a contractile appendage which is longer or shorter according to the species. Energetic as are the contractions of this sort of peduncle, it nevertheless does not present that transverse striation, recalling the texture of the striped muscles, which characterizes the peduncle of the *Vorticellæ*. Claparède and Lachmann (VII. p. 195) have clearly recognized this fact, which helps to establish the distinction between the *Tintinni* and the *Vorticellæ*. Stein has observed that, when the animal detaches itself from its test, the peduncle enters into the body and becomes confounded with it—a proof that it consists of sarcode with no special differentiation.

The superior discoidal extremity or peristome, when the animal is in a state of perfect extension, is placed a little obliquely with relation to the aperture of the test. This position, and the long cilia which garnish it, give it a great resemblance to the disk of the *Vorticellæ*. Nevertheless this similitude is only apparent, as Claparède and Lachmann have well remarked. In fact, the mouth, instead of being placed at the outer margin of the disk, as in the *Vorticellæ*, is situated in its interior, and often even near its centre. The disk itself, instead of being flat or slightly convex, as is the case in the Vorticellina, is hollowed out like a saucer; and the vibratile cilia, instead of forming a single row round the margin of the disk, are implanted in great numbers and in several lines over the greater part of the surface.

The arrangement of these vibratile cilia is exceedingly curious and interesting, and deserves to fix our attention the more because it has not been described by any of the authors who have busied themselves with the *Tintinni*.

The whole margin of the disk is occupied by long and strong motor cilia, which strike the water vigorously and give the animal an exceedingly rapid rectilinear movement of translation. All authors speak of this unruly natation, and of the rapidity with which the animal traverses the field of the objective, and they make it an excuse for any thing that may be imperfect in their descriptions.

I have spoken of a rectilinear movement. It is thus, in fact, that the animals habitually swim; but they can readily deviate from the direct line when they have to avoid an obstacle. Moreover the animal is constantly turning upon itself during its progress, which is therefore comparable to that of a rifle-ball.

As soon as these great motor cilia commence their action, they present the so-called phenomenon of rotation in a high

degree. The undulation is propagated from right to left, the observer being supposed to be placed in the axis of the animal; so that one would imagine he saw a toothed wheel turning in the direction indicated (Pl. XVII. figs. 2, 3, and 4). Are these cilia implanted upon a single circular or spiral line, as Stein supposes? or do they form a broken line? To solve this question we may begin by examining the arrangement of the other cilia which garnish the upper surface of the disk.

These cilia are arranged in parallel lines, all curved in the same direction (fig. 3) and running from the margin of the disk, or peristome, towards the mouth. In one species I have counted twenty-four of these rows. The mouth occupying an excentric position, the rows which start from the margin nearest to that aperture are of course much shorter than those which start from the more distant margin (see figs. 2 and 3); the others are of intermediate length. There are, however, only a few lines of cilia that actually reach the entrance of the mouth; and these are precisely the shortest ones. The others stop so as to leave the central part of the disk naked (fig. 3).

All the rows of which I have just been speaking are formed of thick, short, slightly recurved cilia, scarcely attenuated at their free extremity, and only beating for moments. Their length decreases regularly from the margin of the peristome, which bears the thickest and longest, to the inner extremity of the row, which is formed of much shorter and more slender cilia (see figs. 2 and 3). The shortest rows, which occupy the buccal margin, are also those the cilia of which are shortest on the average.

Let us now return to the motor cilia, to ascertain what relation they may present to the cilia of the disk. And, in the first place, if we carefully examine the margin of the peristome from the upper surface, leaving out of consideration the cilia with which it is furnished, we shall notice that this margin is not simply rounded, but rather denticulated. The teeth resemble those of an ordinary saw; that is to say, each tooth is bounded by two lines, one of which is very long and nearly a tangent to the circumference, while the other is short and nearly follows the direction of a radius. It is unnecessary to say that all the teeth are turned in the same direction. Now this direction is precisely that towards which the rows of short thick cilia deviate; and each of the rows corresponds to one of the denticulations of the margin, in such a manner that it terminates at the base of the longer side of the denticulation, or that which forms a tangent to the margin of the disk.

This arrangement once understood, it is easy to ascertain that the large motor cilia are implanted upon the longer margin of each denticulation. Hence they do not form a continuous circular or spiral line, but a broken line, the segments of which are only simple continuations of the rows of short cilia. In other words, all the cilia, whatever they may be, which garnish the disk are implanted in accordance with about twenty parallel spiral lines. Each row commences tangentially to the margin of the disk by a certain number of motor cilia, then curves towards the centre, bearing thick short cilia, gradually diminishing from the periphery towards the centre.

The entrance to the mouth meets the surface of the disk obliquely, the pharynx being directed towards the left, at the same time gradually contracting (figs. 2 and 3). By looking at the animal in profile (fig. 2) it is easy to see that the pharynx is lodged in a pouch-like lateral projection of the body of the Infusorian. This projection is more strongly marked in certain species, and becomes very striking in meagre individuals when placed exactly in profile (fig. 2). We then see that a certain number of the rows of cilia of the disk (those, no doubt, which start from the margin of the peristome nearest to the mouth) descend into the pharynx, and there form a series of nearly straight parallel lines composed of extremely fine cilia.

The actual margin of the mouth is furnished with tolerably stout and long cilia which beat energetically; but I have not succeeded in ascertaining precisely what relation may exist between these cilia and those which I have just described in detail. All the rest of the surface of the body of the species that I have observed was smooth; at least it is hardly probable that cilia, however fine they might be, could have escaped my observation had they actually existed.

The description that I have just given may seem long. This is because the difficulty of observation is extreme, because the eye must be aided by reasoning, in order to succeed in understanding an arrangement so complex and so novel in science, and because I determined to follow in my exposition the same order as in my researches, so as to facilitate the verification of my results.

Claparède and Lachmann (VII. p. 192) indicate as the general character of the Tintinnodea that these animals are ciliated on their whole periphery, and that the peristome bears vigorous cirri, forming several concentric rows. We have just seen that the general ciliary covering is deficient in many species, and that the cilia of the peristome present an arrangement very different from that indicated by the above authors.

Stein (who is above all preoccupied by the relationship which he supposes to exist between the *Tintinni* and the *Vorticellæ*) declares that the peristome bears cilia only at its margin—namely, a single row, which descends into the mouth, and in this way represents a dextrogyrous spiral. I am quite ready to believe that Stein had before him an Infusorian thus organized, since he tells us so; but this animal certainly was not a *Tintinnus*, and probably belonged to some group allied to the *Vorticellæ*. Another marine form, observed without test, but which this author rightly or wrongly regards as the legitimate proprietor of certain empty tests found in the produce of the same gathering—another form, I say, is described as bearing on the margin of the peristome an outer row of long cilia, and a single inner row of cilia only half the length. It is difficult to judge whether the author had to do with a *Tintinnus* of which he has given only an imperfect description, or with some quite different genus of Infusoria. In any case Stein's observations were less fortunate than those of Claparède and Lachmann, to whom the German writer addressed criticisms as severe as they are undeserved.

If we carefully examine the surface of the disk in the neighbourhood of the mouth, we observe there a slight crescentiform projection, which rises above the side on which the margin of the orifice forms an acute angle (see fig. 3). Are we to compare this projection, with its scarcely indicated outlines, to the part that Stein describes in his so-called *Tintinni* under the name of "forehead," and compares to the disk of the *Vorticellæ*? I cannot tell; but it is certain that the slight swelling in our *Tintinni* has no relation, near or distant, with the disk of the Vorticellina.

The nucleus of our *Tintinni* is very difficult to see. It can hardly be discerned except in famished individuals. Moreover I have not paid much attention to this organ, since it is at present demonstrated that the form, the structure, and the number of the cytoblasts varies infinitely more in the different periods of the existence of a single individual than it differs from one species, or even genus, to another. Hence I have some difficulty in understanding how Stein can so much blame Claparède and Lachmann for not having described the nucleus in the forms observed by them. Whenever I have thought I could see a nucleus it has appeared to me to be situated near the peristome, in the upper part of the body, and to present an oval form (Pl. XVII. fig. 4). Sometimes I have thought that I could distinguish a contractile vacuole in the inferior region of the body (fig. 4). But how is one to arrive at certainty with animals which swim and turn upon themselves

with such rapidity, and only stop when they contract into a shapeless mass?

The test of our animals is composed of a hard slightly elastic material, which, however, breaks when the pressure is slightly increased. This substance resists acids even when tolerably concentrated, and presents no evolution of gas; therefore it is not an earthy carbonate. It burns away entirely at a dull red heat; hence it is not silica. It resists for a long time the action even of tolerably concentrated alkalies; consequently it is not a horny substance. There remains only chitine, to which we are led by the method of exclusion.

Leaving the description of the different forms observed until we come to speak of the genera and species, I shall only remark that the test generally presents two distinct layers, which, however, to all appearance, are of the same chemical composition. All the tests hitherto observed by various authors and by myself may be referred to three types which seem at the first glance very distinctly marked—namely, smooth tests, tests garnished with adherent foreign particles, and latticed tests. However, there are species which establish the transition between the smooth tests and the tests with adherent particles; and on the other hand, among the latticed tests, that which I have had the opportunity of observing was continuous, and only hollowed out by a number of small cavities on its outer surface. It was not perforated, which approximates it to certain smooth tests presenting patterns on their outer surface.

Notwithstanding all my researches, I have not succeeded in observing the reproduction of these animals. On the other hand, I have very frequently observed the initial act of the sexual reproduction of Infusoria, namely conjugation. It is well known that the Infusoria, after arriving at a certain point in their cycle of development, unite two and two and become more or less intimately amalgamated. The nuclei of the two copulated individuals also become amalgamated, and appear to exchange a part of their substance. After this act, which in its essential features corresponds to the fecundation of the Metazoa, the two individuals separate, and each of them reproduces by a phenomenon of total or partial scissiparity.

In the *Tintinni* the presence of the test is not an obstacle to conjugation. The individuals do not quit their tests in order to unite; they amalgamate by the margin of the peristome. The point of union is absolutely constant; it is situated in the vicinity of the mouth, but a little to the left of the latter, in such a way that two individuals in conjugation always form a perfectly symmetrical figure (Pl. XVII. fig. 3).

The union is tolerably extensive and very intimate, and lasts for several hours. During this time the copulated individuals cannot withdraw into their tests; they are condemned to remain in the state of extension; and although their natation is almost as rapid as that of the isolated individuals, this circumstance is none the less favourable to the study of the arrangement of the vibratile cilia of the disk. I believe that without these copulated individuals I should never have succeeded completely in unravelling the question of the mode of implantation of the cilia of the peristome.

Systematic Part.—The genus *Tintinnus* was established, if I am not mistaken, by Otto Friedrich Müller (I.). But under this name that author included a whole miscellaneous group of diverse forms described in a very unsatisfactory manner. Schrank (II.) and afterwards Ehrenberg (III.) circumscribed the genus, and took as its type (and this is important to note) a marine form, *Tintinnus inquilinus*, Schrank, to which Ehrenberg added a second (also marine) species, *Tintinnus subulatus*, Ehrenb.

Dujardin (IV.), again, confounded the *Tintinni* with another and very different genus, namely the *Vaginicolæ*, and grouped together animals some of them free, others sessile, and which had no real relationship. Neither this author nor his predecessors give us descriptions which enable us to distinguish with certainty the animals of which they speak, or especially to form any idea of their organization. It is only by means of the figures they give (which, moreover, are very rough) that we have been able subsequently to ascertain the species named by them.

Claparède and Lachmann (VII.) are the first authors who have given us any precise knowledge as to the structure of these Infusoria. They very justly take as the types the marine species described by Ehrenberg, and group round these first species a whole series of allied forms. They very well describe the form of the body, and the form and structure of the peduncle; they point out with perfect justice the important fact that the Tintinnodea have nothing comparable to the disk of the *Vorticellæ*, and that the vibratile cilia form several rows round the peristome. Where the disk of the *Vorticellæ* is situated, there is here only "a concave depression, the bottom of which goes rising towards the peristome, and becomes confounded with it." Claparède and Lachmann ascribe to all the Tintinnodea a ciliary coat covering the whole body of the animal. This assertion is too general; for there are species, indubitably belonging to this group, of which the body is absolutely smooth. Our authors describe fifteen

new species, all of which they refer to the genus *Tintinnus*, at the same time remarking that the structure of the tests would allow the establishment of a series of generic divisions. In fact among the species which they describe there are some which have a gelatinous test, others an agglutinant test, others a test with small cavities on the surface, and, lastly, others with a delicate smooth test.

On the other hand Ehrenberg (VI.) separated from the *Tintinni* properly so called another genus, including three species and characterized by a test perforated like a trellis or grate. This genus received the name of *Dictyocysta*, Ehr.

So far all went well. The structure and history of the Tintinnodea were imperfectly known, it is true; but at least there were included under this name only forms the relationship of which was real and the characters of which were ascertained in their principal features. Then came Stein (VIII.), who, by an incredible confusion, introduced disorder into the whole characteristic of the group. In fact this naturalist found in the fresh waters an Infusorian with a very elongate test, sometimes free, sometimes fixed; this Infusorian has only a single spiral row of cilia on the peristome, a row which terminates in the pharynx. The surface surrounded by the peristome is smooth, and can be elevated and depressed like the piston of a pump. What does our author conclude from this? That this Infusorian belongs to some genus allied to the *Vorticellæ* but essentially different from the *Tintinni*? By no means! Stein concludes that he has before him the true type of the genus *Tintinnus*, the relationship of which he establishes in consequence, throwing doubt upon at least a part of the results of Claparède and Lachmann. Not being acquainted with the *Tintinnus fluviatilis*, I cannot pass any judgment upon the accuracy of Stein's description; I must accept it such as it is; and then it is evident to me that the German author has seen an animal very different from that which serves as type for the family, an animal which has no interest for us here, since it lies outside the scope of the present memoir. The conclusions which Stein draws from it, as to the characters of the genus *Tintinnus*, lead to error.

I specify still further. The authors who preceded Claparède and Lachmann made no observations upon the arrangement of the cilia surrounding the peristome. Claparède and Lachmann recognize that *Tintinnus inquilinus*, the type of the genus, bears several rows of cilia around a hollow peristome; and they give this character not only to the genus *Tintinnus*, but also to the family Tintinnodea. Our genus is and must

remain so characterized; but we cannot place in it, as Stein has tried to do, forms of which the peristome presents totally different characters.

It is true that Stein observed a marine form which he refers to *Tintinnus inquilinus*, with the body destitute of small vibratile cilia, and, further, nearly the same organization as his *Tintinnus fluviatilis*. As the peristome is not described in detail, and in the complete absence of figures of any kind, it is difficult to judge of the real position of this *Tintinnus inquilinus*. Lastly, a third species, of which Stein proposes to form a genus *Tintinnopsis*, was ciliated over the whole surface of the body, and presented at the peristome two rows of vibratile cilia—an outer row composed of very long cilia, and an inner row of cilia one half shorter; the test was garnished with agglutinated grains. However, it is as well to note that Stein only observed individuals deprived of their tests; he refers them, it is true, to some empty tests found in the produce of the same gathering; but the reader may entertain some doubt as to the correctness of this collocation.

Lastly, Häckel (IX.) describes and figures various forms observed at Lanzarote and Messina. The author declares that the vivacity of these animals prevented his ascertaining all the features of their organization. Nevertheless he makes known a series of very curious and interesting facts. All the forms observed by our author are referred to two genera, namely the genus *Dictyocysta* of Ehrenberg, with a perforated test, and a new genus, *Codonella*.

The *Dictyocystæ* are represented as having a conical body, contracting regularly to the point of attachment, which is at the apex of the test, and with two rows of cilia on the peristome—an outer row of stout and long cilia, and an inner row of stout short cilia. Fortunately the description and the figure precisely belong to one of the species (*Dictyocysta cassis*) that I have had the opportunity of observing; the errors and deficiencies of Häckel's description cannot therefore serve to form a fictitious type, as so often happens. *Dictyocysta cassis* is not gradually attenuated towards its point of attachment, but presents a peduncle quite distinct from the body. The cilia of the peristome are not in two rows, but form a series of parallel spiroid lines, as I have described above. The large cilia of the margin of the peristome are much more numerous and shorter than Häckel figures them; and, finally, *the test is not perforated*, but only hollowed out in pits on its outer surface. It is true that these pits are so strongly marked and so deep that it seems at first sight like an open trellis, and very particular attention is necessary to

recognize the continuous inner lamina which closes the apertures of the trellis.

The three other species of *Dictyocysta* described by Häckel have the test pierced with much larger apertures; and it seems to me difficult to believe that a continuous wall could have escaped observation had it existed. Provisionally therefore we shall consider these species as answering to the character given by Ehrenberg for the whole genus, whilst *Dictyocysta cassis* must be placed elsewhere. On comparing the figure of *Dictyocysta mitra*, Häckel, with the drawing given by J. Müller of the species named *D. elegans* by Ehrenberg, it seems to me that these two tests are identical; *D. mitra*, Häckel, will therefore be only a synonym.

The other forms observed by Häckel are referred to a new genus (*Codonella*), characterized by the presence on the peristome of a membrane in the form of a dentate collar, bearing about twenty appendages like little shreds, each of which is united to one of the teeth of the collar by a filiform part. Beyond this membrane there is a circular row of long motor cilia, twenty in number. Three species were observed, one of which had the body covered with little cilia, while the other two species have the body smooth. The test presents protuberances and regular striæ, and is covered in part with agglutinated siliceous particles. Häckel supposes that the forms described by Claparède and Lachmann, of which the tests resemble those of his *Codonellæ*, belong in reality to that genus. This appears to me very doubtful; for I have myself observed a species of Tintinnodean (Pl. XVII. fig. 5) of which the test much resembles that of *Codonella campanella*, Häck., and which, by the arrangement of the cilia of the peristome, proves to be a true Tintinnodean, and not a *Codonella*.

Häckel at once raises the two genera *Dictyocysta* and *Codonella* into two families distinct from the Tintinnodea: this is a rapid mode of doing business; and I believe that his family Dictyocystida in particular has no right to exist. As to that of the Codonellida, it may subsist, at any rate until the structure of the *Codonellæ* is better known.

I propose the following classification, which has no pretention to be any thing more than a provisional arrangement.

Family Tintinnodea, Clap. & Lachm.

Test in the form of a little bell, free. Animal conical, retractile, attached to the test by a retractile peduncle without striæ or distinct layers. Periphery of the body garnished with very fine vibratile cilia, or completely smooth. Supe-

rior extremity truncate, constituting a discoidal peristome, hollowed out like a saucer, garnished with motor cilia at the margin, and with short cilia towards the interior. Cilia of the peristome all arranged in accordance with about twenty curved lines, starting from the interior of the disk to become tangents to the margin of the peristome. Mouth large, excentrical; pharynx furnished with cilia by the prolongation of some of the rows of cilia of the disk. Nucleus situated in the anterior part of the body; contractile vesicle towards the middle of the body; anus near the point of insertion of the peduncle. Conjugation and internal formation of embryos observed in various species.

Genus 1. Tintinnus, Schrank.

Test smooth, firm, chitinous, transparent, free from foreign bodies.

Tintinnus ampulla, sp. n.
(Pl. XVII. figs. 1–3.)

Test ovoid, terminated posteriorly by a slight projection in the form of a point, widely open above, where a widened, funnel-like portion is superposed upon the ovoid part. The widened portion composed of two zones, of which the superior is more turned out than the inferior one. At the boundary between the two zones, on the inner surface, there is a slight circular projection notched into the likeness of an arcade. Lines of cilia on the peristome to the number of twenty-four. Body smooth. Length of the test 0·087 millim.; diameter at the entrance 0·081 millim.

This species is the commonest of those that I have met with at Villefranche-sur-Mer. I have seen hundreds of it in the produce of my fishings.

Tintinnus spiralis, n. sp.
(Pl. XVII. fig. 4.)

Test greatly elongated, pointed, drawn out; the posterior third nearly cylindrical over a certain extent, very narrow, terminated by an acute point; the anterior two thirds in the form of an elongated cone, slightly inflated; near the orifice a thickening in the form of a cushion projecting outwardly. Test composed of two very distinct layers, presenting at the surface some faintly-marked and somewhat irregular striæ, generally parallel, oblique to the axis of the test, and describing very elongated dextrogyrous spirals; small points arranged in spiral lines parallel to the striæ, and alternating with them.

The cushion that surrounds the orifice is formed solely by the outer layer.

Animal short; peduncle much elongated, attached at a considerable distance from the apex of the test, or even presenting two points of attachment. Lines of cilia on the peristome to the number of about twenty; body smooth.

Length of the test 0·4 millim.; diameter of the orifice 0·09 millim.

I have met with only a small number of specimens of this delicate species at Villefranche.

Our genus, characterized as above, will in all probability include:—*Tintinnus inquilinus*, Schrank; *T. obliquus*, Clap. & Lachm.; *T. amphora*, C. & L.; *T. acuminatus*, C. & L.; *T. Steenstrupii*, C. & L.; *T. quadrilineatus*, C. & L.; *T. subulatus*, Ehr.; *T. cinctus*, C. & L.; and *T. urnula*, C. & L.

Perhaps it will be necessary to establish a special generic division for the species with a gelatinous sheath, such as *Tintinnus mucicola*, &c.

Genus 2. Coniocylis, g. n.

Test with more or less marked transverse striæ, impregnated, especially in parts, with foreign mineral particles agglutinated and stuck upon its outer surface; posterior extremity generally drawn out.

Coniocylis campanula.

Tintinnus campanula (Ehr.), Clap. & Lachm.
(Pl. XVII. fig. 5.)

This species occurred repeatedly at Villefranche, but always only a very few specimens. The cilia of the peristome appeared to me to be arranged as in the other Tintinnodea.

Length of the test 0·14 millim.; width at the entrance 0·218 millim.*

It is in this genus that we must place *Tintinnus helix*, Clap. & Lachm., *T. annulatus*, C. & L., *T. ventricosus*, C. & L., and probably Stein's *Tintinnopsis*.

Genus 3. Cyttarocylis, g. n.

Test continuous, but excavated at its outer surface by a quantity of deeper or shallower pits, often pretty regular and capable of giving the test the aspect of a trellis; posterior extremity generally pointed, frequently more or less turned to one side.

* [From the figure these measurements appear to have been reversed.—Eds.]

Cyttarocylis cassis.

Dictyocysta cassis, Häckel.
(Pl. XVII. fig. 6.)

Test excavated at the surface with deep pits formed only by a delicate membrane, irregular, at least twice as large in the neighbourhood of the orifice as in the region of the apex; conical, suddenly widened out near the aperture.

Animal conical, attached by a peduncle to the apex of the test; peristome bearing twenty rows of cilia. Surface of the body smooth.

Length of the test 0·117 millim.; width at the orifice 0·078 millim.

It is in this genus, no doubt, that *Tintinnus denticulatus* and *T. Ehrenbergii*, C. & L., will have to be placed.

We reserve the name of *Dictyocysta* for the species in which the test is really perforated and reduced to a sort of open cage, such as *Dictyocysta elegans*, Ehr., *D. mitra*, Häck., *D. lepida*, Ehr., *D. acuminata*, Ehr., *D. templum*, Häck., and *D. tiara*, Häck.

As to *Tintinnus fluviatilis*, Stein, I have already expressed the opinion that it is not a Tintinnodean at all. The family Codonellidæ is differentiated by the small shreds of the margin of the peristome, although the tests very closely resemble those of the genus *Coniocylis*.

The relationship of our family is sufficiently indicated by the peculiar structure that I have described. It is clear that their relationship to the Vorticellina of which Stein speaks has no existence, and that our Infusoria differ still more from the *Vorticellæ* and Stentors than these do from each other. I shall not discuss the question whether the Tintinnodea should enter into the order Peritricha; for that order seems so little in accordance with nature that it can hardly be maintained. Stein himself seeks in vain to find a character common to all the families of which he composes this heterogeneous order. The definition that he endeavours to give of it degenerates into a casuistical statement in which the characters of all the families are enumerated, making the profound differences which separate them still more striking. If, notwithstanding, our author finds "an incontestable air of relationship" in all these creatures, this is an affair of sentiment; and this sentiment we are perfectly free not to share in.

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XXII.—*On* Viquesnelia atlantica, *Morelet & Drouet.*

By Francisco d'Arruda Furtado *.

[Plate XIII.]

The history of the genus *Viquesnelia* is sufficiently well known, but may usefully be repeated here. It was founded by Deshayes, upon some fragmentary Roumelian fossils†. D'Archiac discovered another fossil representative of the genus in the Pyrenees‡. The only surviving species known are one native to India (*V. Dussumieri*, Fischer §) and a second found in the Azores; the latter is the subject of the present paper.

I have not been able to obtain Fischer's memoir on the Indian species; but the absence of any description of the animal in various conchological manuals, which at the same time make mention of the species, leads me to suppose that the detailed structure of *Viquesnelia* has not hitherto been

* Translated, with notes, by Prof. L. C. Miall.

† ["Note sur un nouveau genre de Limacien fossile," par M. Deshayes, Journal de Conchyliologie, 2e sér. tom. i. p. 283, pl. vii. figs. 14–17 (1856). The fossils in question (*V. lenticularis*, Desh.) were obtained by M. Viquesnel from rocks believed to be of the age of the Nummulitic Limestone, at Balouk-Keni, near Feredjik, Roumelia.—M.]

‡ [In a footnote to the paper cited above, Deshayes remarks that D'Archiac had found a *Viquesnelia*-stratum in the lower part of the Nummulitic deposit of the Pyrenees. This is apparently the authority for the statement in the text.—M.]

§ ["Addition à la Note sur le Genre *Viquesnelia*," Journ. de Conchyliologie, 2e sér. tom. i. p. 290. In this short memorandum Fischer explains that some shells of Limacidæ obtained at Mahé by Dussumier are preserved in the Museum at Paris, and that Valenciennes had attached to them a label bearing the name *Clypeicella Dussumieri*. The species is now included in *Viquesnelia*.—M.]